A new species of *Burttia* Dirsh (Caelifera, Acridoidea, Acrididae, Catantopinae) from the Eastern Arc Mountains of Tanzania

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Abstract

A new species of *Burttia* Dirsh, *B. caerulea* sp. nov., is described from the Nguru Mountains of Tanzania. It is the second species in the genus, both being restricted to Tanzanian localities. Both *B. sylvatica*, known only from the Uluguru Mountains, and *B. caerulea* sp. nov. are morphologically very similar in habitus and outer morphology, suggesting a recent speciation.

Keywords

East Africa, grasshopper, taxonomy

Introduction

The genus *Burttia* Dirsh, 1951 was erected by Dirsh (1951). The type species, *B. sylvatica* Dirsch, 1951, is endemic to the Uluguru Mountains in Tanzania. Except for its description, no biological or ecological information is available on this small catantopine genus. The genus is characterized by being flightless without any trace of wings, a rugose integument, and antennae that are longer than the head and the pronotum together and compressed at the base. The head is conical and the fastigium verticis acutely angular, with the apex strongly projecting forwards and with a longitudinal concavity. The occipital carinula is sharp and the frons strongly oblique. The dorsum of the pronotum is almost flat, with a well-developed median carinula. Three narrow sulci cross the dorsum of the pronotum. The prosternal process is conical with a wide base. The subgenital plate is upcurved with an obtuse apex. The valves of the ovipositor in females are long and slender, with slightly curved apices (Dirsh 1965).

In the Nguru Mountains of Tanzania, a second, morphologically very similar species was found and is described in this paper. The biogeography of *Burttia* and of Orthoptera taxa restricted to the Eastern Arc Mountains is discussed.

Materials and methods

Measurements.—The total body length refers to the body length of the insect from the tip of the fastigium verticis to the tip of the abdomen.

Genital preparations.—For genital preparations, specimens were relaxed in water, the phallus extracted manually, macerated in 5% KOH, then neutralized in 5% acetic acid and stained with acid fuchsin.

Depositories.—CCH: Collection of Claudia Hemp.

Results

Taxonomy

Family Acrididae
Subfamily Catantopinae

Genus *Burttia* Dirsh, 1951

Type species.—*B. sylvatica* Dirsh, 1951, by original monotypy

Burttia caerulea Hemp, sp. nov.

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Type material.—**Holotype:** TANZANIA • male; Nguru Mountains, montane forest above Ubiri, 1740 m; -6.044233°, 37.562823°; February 2021; CCH.

Paratypes: TANZANIA • 3 males, 4 females; same data as holotype; CCH.

Diagnosis.—*Burttia caerulea* sp. nov. is morphologically very similar to *B. sylvatica* and thus fits exactly the generic description given by Dirsh (1965). Even the coloration is similar, although males of *B. caerulea* n. sp. have brighter blue bases of the antennae (Fig. 1). Overall, *B. caerulea* sp. nov. is larger and stouter than *B. sylvatica* (Fig. 2). Both species have large, paired tubercles on the supra-anal plate, but while those of *B. sylvatica* are vertical and rounded, those of *caerulea* sp. nov. are pointed towards the rear and more acute. The male supra-anal plate of *caerulea* is proportionately shorter than that of *sylvatica*, and it has paired longitudinal depressions basally, unlike the single midline depression of *sylvatica*

Fig. 1. *Burttia* species. **A.** *B. caerulea* sp. nov. from the Nguru Mountains; **B.** *B. sylvatica* from the Uluguru Mountains.

Fig. 2. Male of *Burttia* species. Left: *B. caerulea* sp. nov.; right: *B. sylvatica*. *B. caerulea* sp. nov. is larger and stouter than *B. sylvatica*.

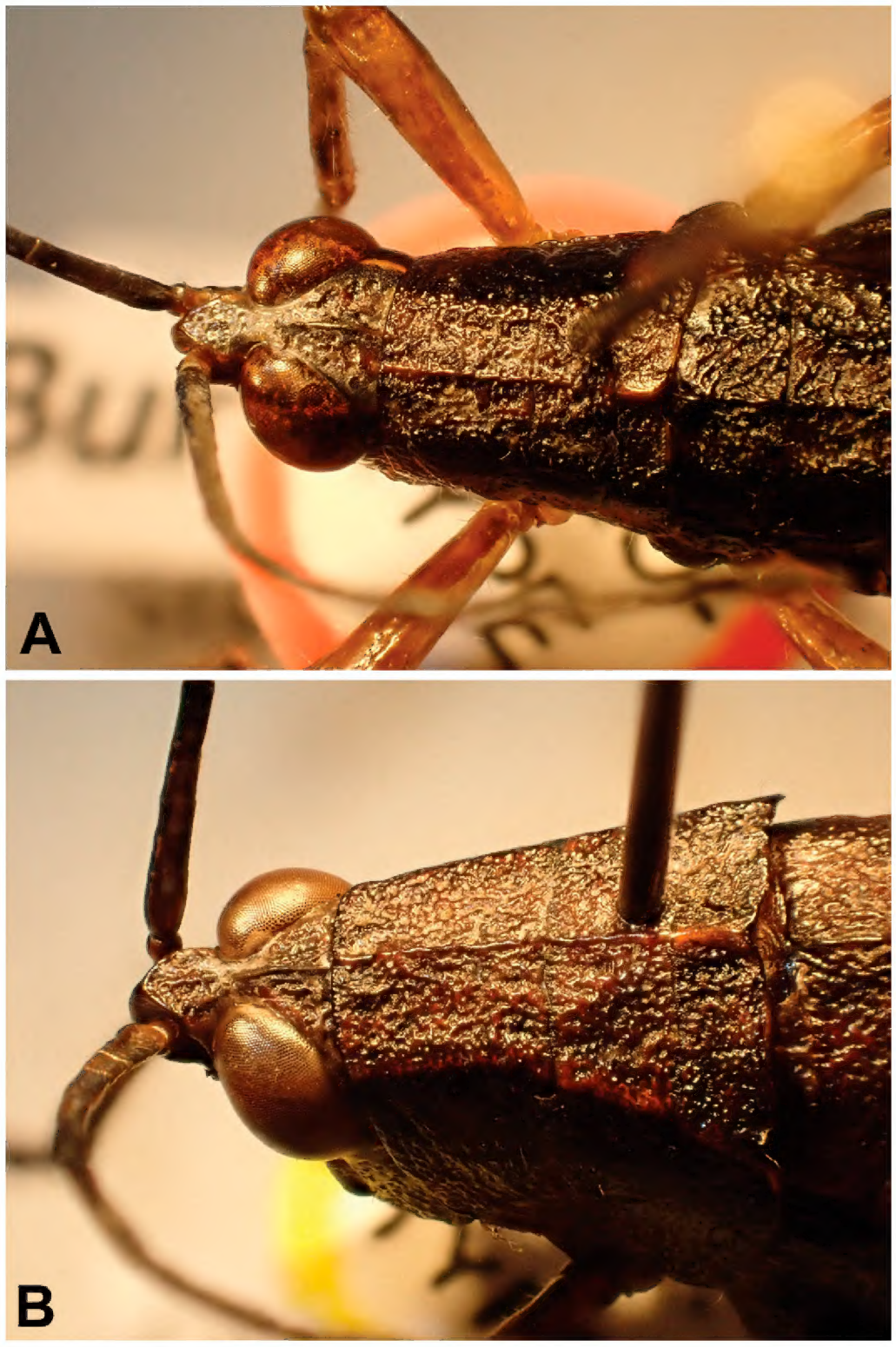

Fig. 3. Lateral view of head and pronotum of male (**A**) and female (**B**) *Burttia caerulea* sp. nov.

(Fig. 6A, B). Other differences are found in the epiphallus (Fig. 5). *B. sylvatica* has a smaller epiphallus compared to *B. caerulea* sp. nov. with smaller lophi. On the shoulder between the lophi and the bridge in *B. sylvatica*, only small humps are present that are roundish and more pronounced in *B. caerulea* sp. nov. (compare Figs 5, 6F, H). *B. sylvatica* is endemic to the Uluguru Mountains while *B. caerulea* sp. nov. is only known from the montane zone in the Nguru Mountains. The linear distance between these mountain ranges is about 100 km.

Etymology.—From Latin: *-caeruleum* = blue, because of the blue bases of the male antennae.

Description.—**Male**. Body, part of face, and outer sides of knees of hind legs dark brown. Legs creamy to white except for black tarsi and greyish blue hind tibiae. With broad white fascia across face. Bases of antennae blue (Fig. 1A). Antenna about 1.5 times longer than head and pronotum, compressed at base (Fig. 2A). Eyes oval, prominent. Fastigium verticis angular, with apex forming a rostrum, as described for the genus. Frons strongly oblique (Fig. 1A), upper part of frontal ridge strongly protruding in front of eyes, sulcate. Dorsum of pronotum with well-developed median carina (Fig. 3A). Integument of whole body strongly wrinkled (Fig. 2). As described for the genus, prosternal process very pointed with a broad base. No trace of wings. Supra-anal plate elongate with two well-developed tubercles near middle of supra-anal plate (Figs 4A, 6B). Subgenital plate upcurved, with obtuse apex (Figs 4A, 6B). Epiphallus divided, with large complex lophi; ancorae small and inwardly directed (Fig. 5B). Paired post-epiphallic sclerites present. Endophallic structures normal, aedeagus partly sheathed in ectophallic membrane (Fig. 6K).

Female. Larger and stouter than male (Fig. 1A), almost uniformly dark brown, without white fascia on face. As in male, with a median carina on the pronotum (Fig. 3B). Supra-anal plate elongate with a median ridge (Fig. 7A). Valves slender with curved apices, cerci short. Subgenital plate with slightly excurved posterior margin (Fig. 7B, C).

Measurements (mm).—Males (N = 4): Body length: 15.6–18.0; Medial length of pronotum: 3.1–3.4; length of hind femur: 10.1–10.3. Females (N = 4): Body length: 22.6–22.8; Medial length of pronotum: 4.3–4.5; length of hind femur: 13.0–14.4.

Habitat.—Along forest edges and in understory vegetation of montane forest, often on the forest floor among litter.

Distribution.—Tanzania, Nguru Mountains.

Discussion

Burttia was a monotypic catantopine genus up to now, with the species *B. sylvatica* described from the Uluguru Mountains. The second species described in this paper is morphologically closely related to *B. sylvatica*, since only minor differences are found in their outer appearance; the colour pattern and the phallic complexes of both species are very similar. Also, the habitat is analogous, both species being litter and herb dwellers of montane forest.

Taxonomic aspects

Dirsh (1951, 1965) placed *Burttia* in the Catantopinae, an ill-defined subfamily that has a history of use as a repository for tropical species that do not fall readily into other, better-defined, Old World subfamilies. Dirsh (1951) noted that *Burttia* "is not closely related to any known Catantopine genus". Our examination of the phallic complex shows that, in comparison with other Catantopine genera, *Burttia* is unusual in the following features:

A) Two small sclerites are found in the epiphallic membrane posterior to the epiphallus, approximately midway to the cingulum (Fig. 6C, D). Such post-epiphallic sclerites are common in some Acrididae (for example, the Neotropical Ommatolampinae) but, to our knowledge, have not been found previously in the Catantopinae.

B) The epiphallus is divided medially into two symmetrical halves. This arrangement is characteristic of some subfamilies (Oxyinae, Coptacrinae, and Euryphyminae) but is very rare in the Catantopinae, where it is known only in *Merehana* Kevan, 1957 and *Anischnansis* Dirsh, 1959, both of which are considered to be exceptional genera.

C) Dirsh (1951) suggested that *Burttia* might be related to the catantopine genus *Gemeneta* Karsch, 1892, another apterous African forest floor dweller, recently revised by Oumarou-Ngoute and Kekeunou (2017). Our examination of the phallic complex of *Burttia* spp. does not support this hypothesis, as the two genera are

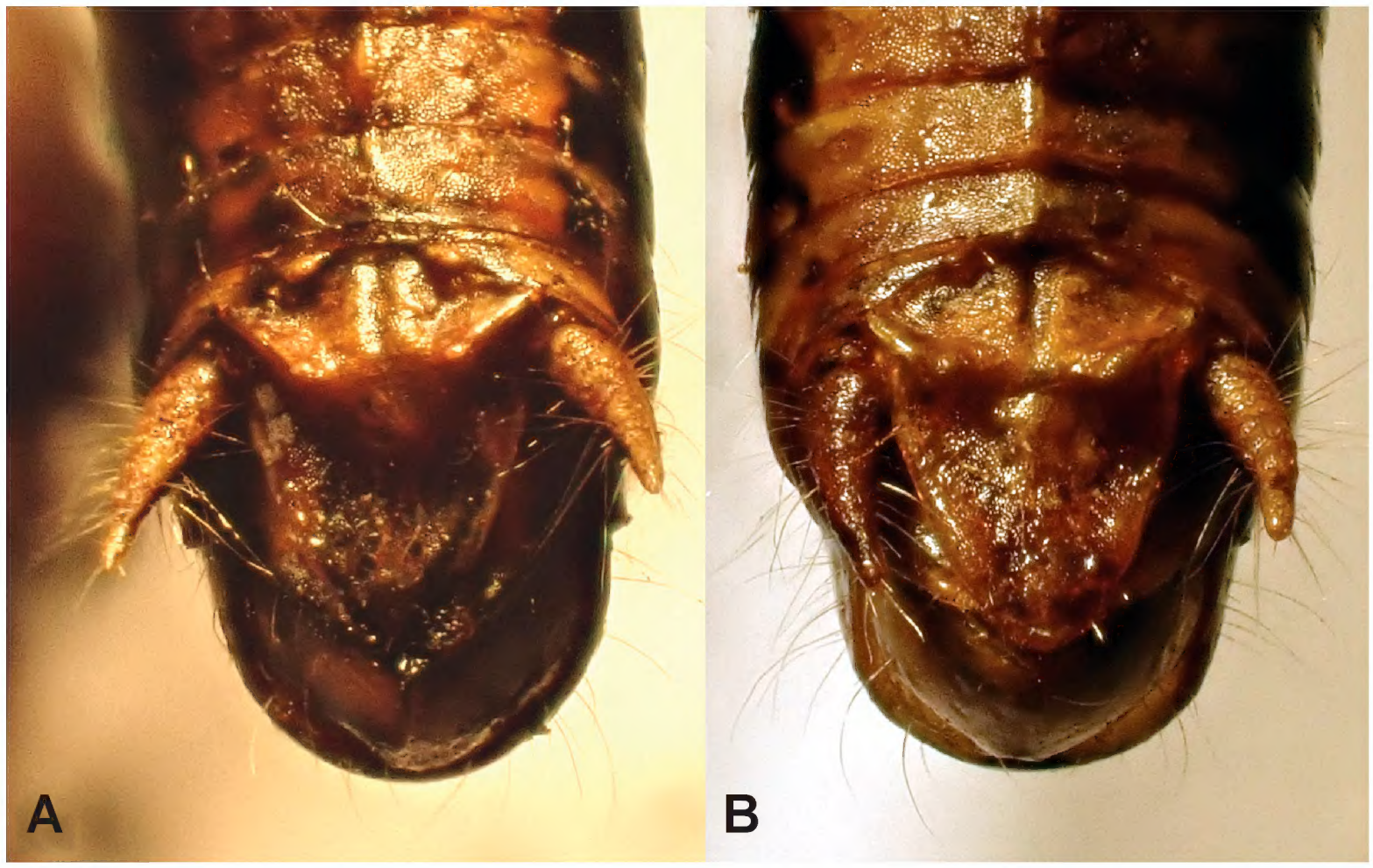

Fig. 4. Abdominal apices, dorsal view, of male *Burttia caerulea* sp. nov. (**A**) and *B. sylvatica* (**B**).

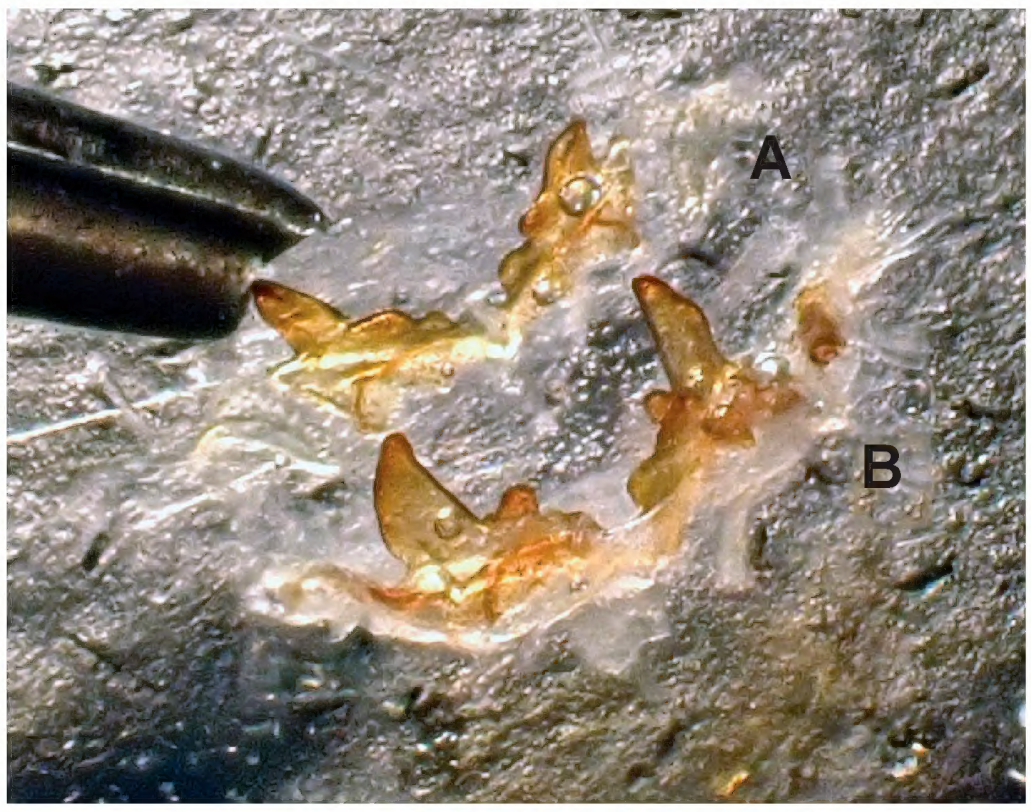

Fig. 5. Anterior axial view as epiphallus as situated when looking at opened apex of abdomen. **A.** *Burttia sylvatica*; **B.** *B. caerulea* sp. nov.

very different in this respect. Their external morphological similarity (aptery, dark coloration) is more likely due to convergent adaptation to identical habitat and lifestyle.

Due to the paucity of available material and a wish to avoid damage to a unique specimen, we did not dissect out the endophallus of *B. caerulea* sp. nov. However, visual inspection showed that it appeared to be identical in all respects with that of *B. sylvatica* (Figs 5, 6). Only the epiphalli show any obvious difference between the two species.

Biogeography

The Nguru Mountains, situated between the Usambara and Pare Mountains in the north of Tanzania and e.g., the Ukaguru, Rubeho, Uluguru, and Udzungwa Mountains further south harbour a mix of species typical for the Eastern Arc Mountains. Thus, the Ngurus share species of the Eastern Arc endemics *Philoscirtus* Karsch, 1896 (Hemp et al. 2015b) and *Physocrobylus* Dirsh, 1951 with the Usambara Mountains (not occurring further south), while the second species of *Burttia*, *B. sylvatica*, is endemic to the Uluguru Mountains in the north. Other flightless genera endemic to the Eastern Arc Mountains (and coastal forests) are the Pseudophyllinae genera *Pseudotomias* Hemp, 2016 (Hemp 2016) and *Dendrobia* Hemp & Ingrisch, 2017 (Hemp et al. 2017), distributed throughout these ancient mountain ranges. In Conocephalinae, *Afroagraecia* Ingrisch & Hemp, 2013 and *Afroanthracites* Hemp & Ingrisch, 2013 occur with at least one species on most of the Eastern Arc Ranges. Molecular phylogenetic analyses and studies on the acoustics have shown that species of the Agraeciini genus *Afroanthracites* are closely related to each other and have speciated during the past 1–2 million years—after the formation of Mt Kilimanjaro, which serves as a time marker (Hemp et al. 2015a, 2016). The same time scales were found in, e.g., the Ccoptacrinae genus *Parepistaurus* Karsch, 1896 or members of the family Lentulidae (*Rhainopomma* Jago, 1981, *Altiusambilla* Jago, 1981) (Hemp et al. 2015c, 2020). Even fully alate and thus more mobile Orthoptera speciated in the Eastern Arc Mountains and in coastal forests such as the Phaneropterinae *Lunidia* Hemp, 2010 (Hemp et al. 2010; Hemp 2017), showing on the one hand that the Eastern Arc Mountains harbor many old taxa on a generic level, isolated many million years ago during the fragmentation of the once continuous forest belt connecting west, central, and east Africa. On the other hand, climatic fluctuations over the past few million years were probably the motor for young radiations in the above-mentioned genera, as shown for the Hexacentrinae genus *Aerotegmina* Hemp, 2001 (Grzywacz et al. 2021) or suggested for the Pseudophyllinae *Pseudotomias* Hemp, 2016 (Hemp 2016). *Pseudotomias*, or *Stenampyx* Hemp, 2020 (Hemp 2020) probably have close relatives in central and west Africa. Further studies, including screening of the montane zones in the Eastern Arc Mountains and including molecular and cytogenetical analyses, should be conducted to illuminate modes and times of speciation of various Orthoptera taxa in East Africa.

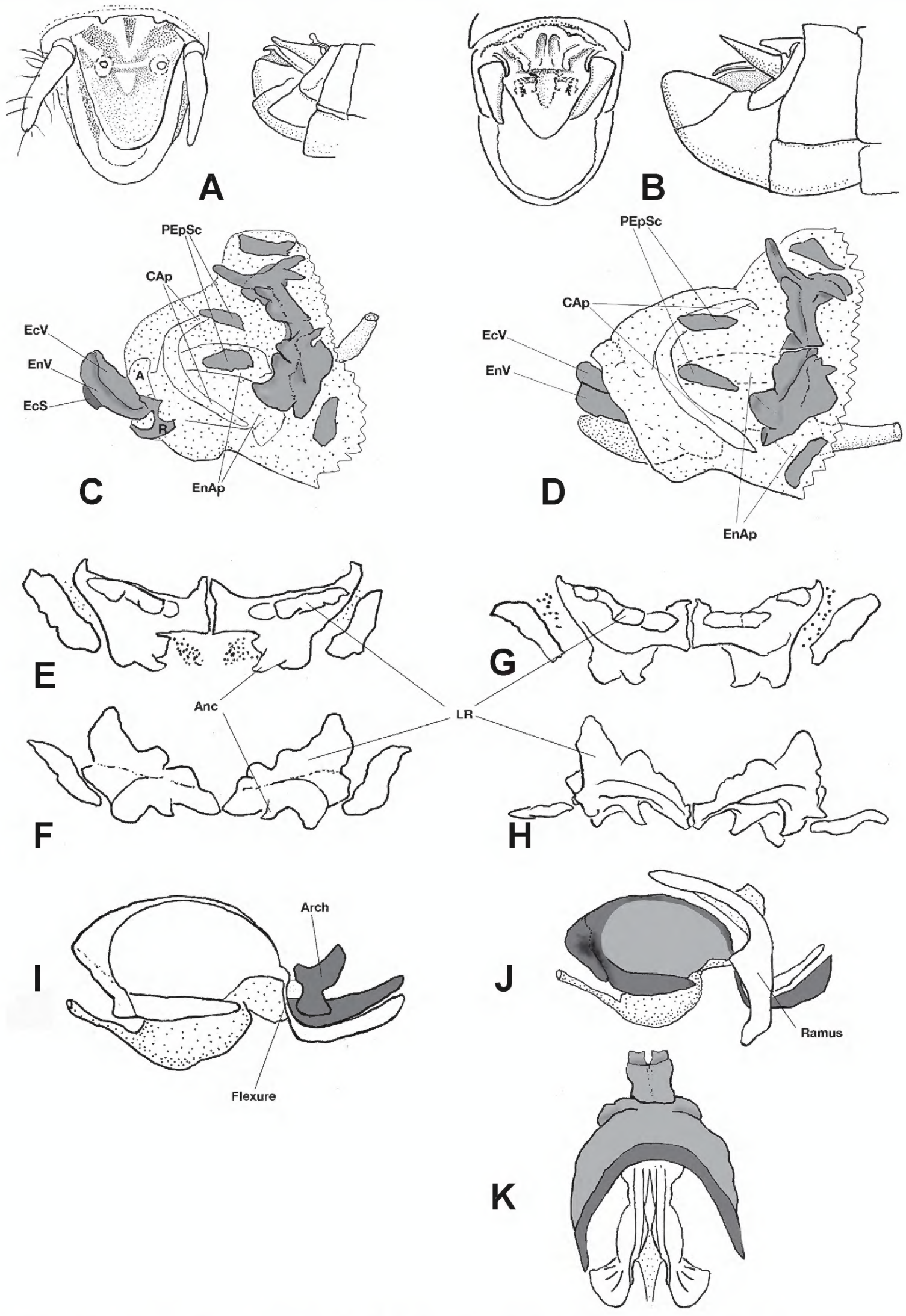

Fig. 6. A, C, E, F, and **I** are *Burttia sylvatica*; **B, D, G, H, J,** and **K** are *B. caerulea* sp. nov. **A.** *Burttia sylvatica*, male terminalia in dorsal and lateral views; **B** as **A** but *B. caerulea* sp. nov.; **C.** (*B. sylvatica*); and **D.** (*B. caerulea* sp. nov.). Oblique dorso-lateral view of entire phallic complexes. Membrane is shown dotted. The shaded sclerites are the epiphallus and its lateral "oval" sclerites (unlabelled, at the right-hand edge of each figure), the paired post-epiphallic sclerites (PEpSc), the right-hand side ectophallic ramus (R) in **C** only, and the aedeagal valves (EcV, ectophallic (dorsal) aedeagal valve; EnV, endophallic (ventral) aedeagal valve; EcS, fragment of ectophallic sheath left adhering to ventral valve during dissection). The remaining sclerites are indicated only by outlines, indistinctly visible through the membrane (A, arch; CAp, cingular apodemes; EnAp, endophallic (basal) apodemes). **E, F.** *Burttia sylvatica*, epiphallus; **E.** dorsal view; **F.** axial view. Note trilobed lophal ridge (LR), divided epiphallic bridge, and large irregularly shaped "oval" sclerites and inwardly directed ancorae (Anc). **G** and **H** as **E** and **F** but *B. caerulea* sp. nov. Phallic complex with ectophallic membrane, zygoma, cingulum, and rami removed to expose the arch and the endophallic flexure. Arch and LHS ectophallic valve shaded. **J.** *Burttia caerulea* sp. nov. Phallic complex with ectophallic membrane removed, showing endophallus, cingulum with LHS ramus and LHS ectophallic valve. Endophallus shaded. **K** as **J** but dorsal view. Ectophallic elements shaded.

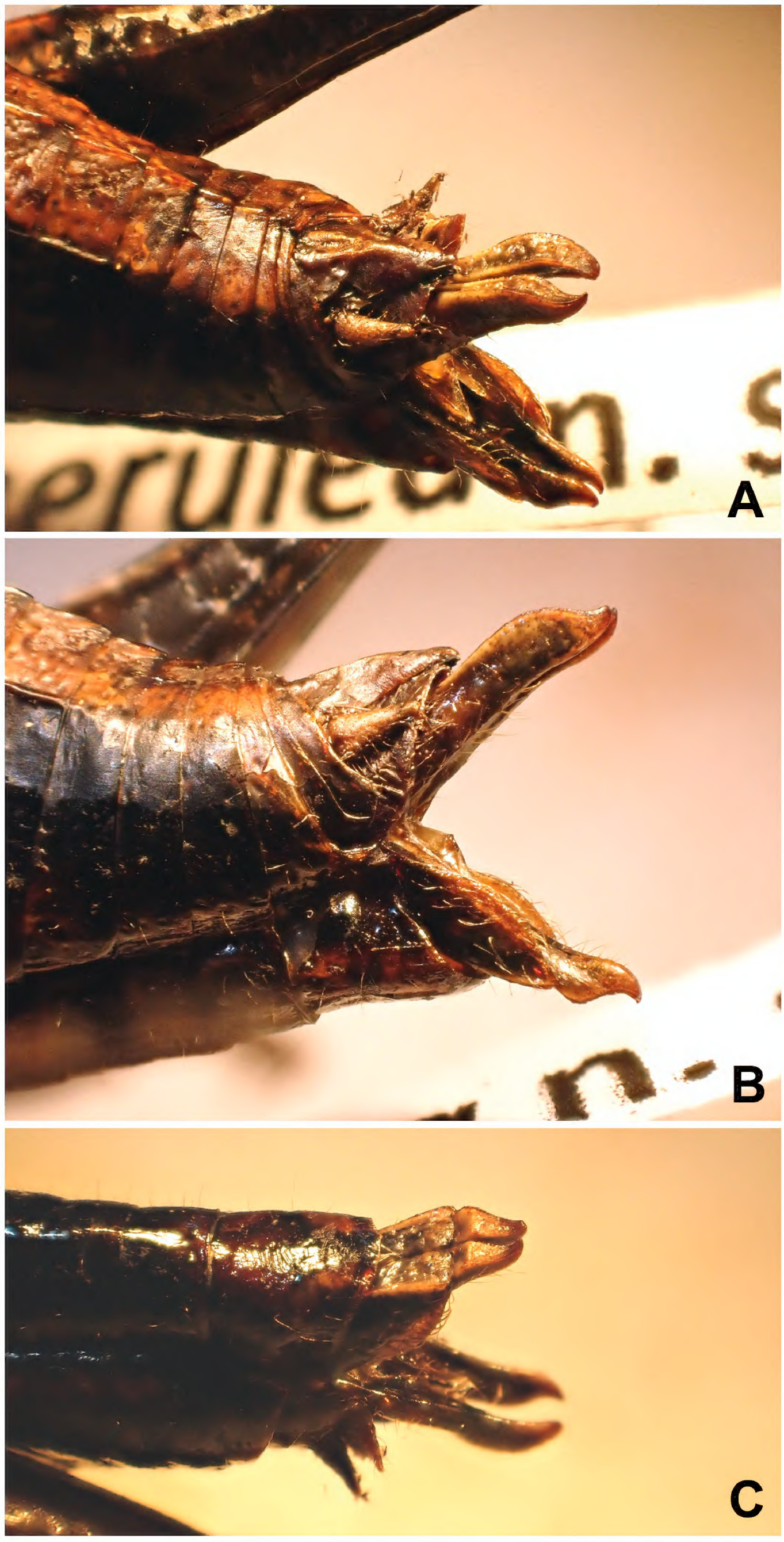

Fig. 7. Abdominal apex of female *Burttia caerulea* sp. nov. **A.** semilateral; **B.** lateral; **C.** semilateral view.

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